2.4 NOISE

2.4.1 Affected Environment

The extended study area is located in a central urban setting that includes arterial roadways and side streets, commercial, office and recreational land uses, and is close to the flight paths of aircraft approaching and departing National Airport. (See Figure 2-2 for generalized land use in the extended study area.) Although the existing roadway system is and will continue to be a major source of noise in the area, other noise sources such as aircraft, pedestrian activities, and building ventilation and air conditioning equipment are also evident.

Changes in traffic volumes and speeds or in the mix of vehicles (cars, trucks, and buses) can alter the levels of noise along existing roadways and streets. As a result of changes in traffic characteristics on numerous streets in the extended study area occurring after the security action, an analysis of noise and its potential impact on sensitive receptors was conducted.

Noise Metrics. Noise levels in the area of the security action are typical of an urban location consisting of land uses as noted above, and are, for the purposes of analyzing traffic noise impacts, presented in terms of the A-weighted equivalent sound level, abbreviated as L_{eq}. This sound level is a single-number representation of the actual fluctuating sound level that accounts for all the sound energy during a given period of time. The units of L_{eq} are A-weighted decibels, or dBA. The A-weighting means that the sound level is measured in a method that approximates the response of the human ear with de-emphasis of low and very high frequencies and emphasis on the mid-frequency range. Generally, the minimum change in noise levels that the human ear can perceive is 3 dBA.

The Federal Highway Administration (FHWA) has established Noise Abatement Criteria (NAC), as illustrated in Table 2-10, for road and highway projects based on various land uses. These criteria are used to determine when abatement or mitigation of noise levels should be considered in a highway project. Land uses in the extended study area are predominantly Category B, which includes hotels, churches and parkland and has an NAC criterion of 67 dBA, and Category C, which consists of commercial and office uses and has an NAC criterion of 72 dBA.

Table 2-10
FHWA Noise Abatement Criteria

Land Use Category	L_{eq}	Description of Land Use
A	57 dBA	Tracts of land in which serenity and quiet are of extra-ordinary significance, which serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	67 dBA	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, picnic areas, playgrounds, active sports areas, and parks
C	72 dBA	Developed lands, properties, or activities not included in Categories A and B
D	---	Undeveloped lands
E	52 dBA (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums

Noise Levels Prior to the May 20, 1995 Security Action. Due to the emergency nature of the security action, no systematic noise measurements were taken in the extended study area prior to the action. However, previous studies completed on other projects in central Washington give an indication of what the range of noise levels would have been prior to May 20, 1995. Four environmental impact studies for highway and urban development projects were examined to determine what levels of noise may have existed in the extended study area. These studies included measurements of actual noise levels at 14 sites adjacent to streets and roads, including portions of Pennsylvania Avenue east and west of the White House, that would be considered relevant or similar to the types of locations affected by changes in vehicular traffic in the vicinity of the White House. Table 2-11 presents a summary of these measurements and indicates that noise levels adjacent to streets and roadways in central Washington ordinarily have ranged from 64 dBA to 78 dBA. Review of additional urban traffic noise studies conducted in New Haven, New York City, Norfolk, and Miami confirm that this range of ambient noise levels is typical of central city locations.

Noise levels in heavily urbanized areas can vary considerably over short periods of time because of the intermittent or erratic occurrence of other extraneous noise incidents such as aircraft passing nearby, construction vehicles and equipment operating in the area, and the passing of emergency vehicles using their sirens. Additionally, in urban locations such as downtown Washington, D.C., sensitive noise sites can be in close proximity to roadways (e.g., as close as 10 to 25 feet) or further away such as the central portions of parks that are hundreds of feet from sources of traffic-generated noise. Vehicles passing close to a receptor, even when traffic levels are not high, can create high levels of noise. However, noise levels decay rapidly with distance away from a roadway, with a 3 dBA decrease for every doubling of distance from the noise source. Thus, a noise level of 67 dBA 10 feet from a roadway edge would be 64 dBA 20 feet away, and 61 dBA at a distance of 40 feet from the roadway.

Table 2-11
Ambient Noise Levels in Central Washington, D.C.
As Measured in Previously Conducted Studies

Study Date	Study	Number of Sites Measured[(a)]	Range of Noise (in $dBA_{(Leq)}$)
1982	Federal Triangle Environmental Impact Statement[(b)]	3	69 to 78
1982	Environmental Assessment of Eastern Sector of Pennsylvania Avenue Development Area[(c)]	7	65 to 76
1985	Whitehurst Freeway Environmental Impact Statement[(d)]	2	64 to 66
1995	Barney Circle Freeway Modification Environmental Assessment[(e)]	2	68 to 70

(a) Noise monitoring locations similar to those in White House Extended study area.
(b) Federal Triangle Master Plan Environmental Impact Statement, GSA, 1982.
(c) Environmental Assessment Eastern Sector Proposed Changes, Pennsylvania Avenue Development Corporation, 1982, Appendix B, p. B-12.
(d) Whitehurst Freeway Corridor System Modification Study, Final Environmental Impact and 4(f) Evaluation, D.C. Department of Public Works, 1985, p. 3-45.

2.4.2 Impacts Analysis Methodology

Because of the emergency nature of the security action, no noise measurements were conducted prior to the action. To establish comparative background noise data, four previous studies conducted in similar central Washington, D.C. locations were examined, and the results provided in Section 2.4.1 and in Table 2-11. Review of additional studies of urban traffic noise from other cities was undertaken to confirm the range of noise levels shown in Table 2-11.

To conduct actual monitoring of post-action noise levels, fourteen representative sensitive noise receptor sites were selected in the extended study area. Noise was monitored at each of these sites. The noise levels recorded were compared to the noise data provided by the four previous studies and the reviews of noise levels in other cities to confirm the general range of noise levels.

An FHWA traffic noise prediction model, described in Section 2.4.3, was then used to predict post-action noise levels at the same 14 receptor sites used for the monitoring. The post-action model results were compared against the actual measured noise levels at the sites to verify the capability of the model to accurately predict actual noise levels. The pre-action noise level data was then modeled and compared to the modeled post-action noise levels.

2.4.3 Impacts Analysis

To establish the effects of noise resulting from the security action, selected exterior sensitive receptors in the extended study area were examined. The selected receptors are primarily locations that are accessible to the public and that are also representative of other similar receptors in the extended study area. The selected receptors include parkland, the front grounds of a church, a monument, and street corner locations at two museums. In addition, an exterior location on the east side of the White House north portico facing Pennsylvania Avenue was also examined. This location is accessed by members of the public following visits to the White House and just before exiting to Pennsylvania Avenue, and is considered to be particularly sensitive to noise intrusion. In all, 14 sites were identified as being both sensitive receptors and locations that are representative of receptors in the extended study area. The 14 sites are shown on Figure 2-7.

Noise was monitored at each receptor site using a RTA Technology Environmental Noise Logger meter for a 15-minute period. Noise levels were recorded in $dBA_{(Leq)}$ and are shown in Table 2-12.

Noise levels recorded at the 14 sites ranged from 56 dBA to 74 dBA. The average reading for all sites is 66 dBA and both the individual and average noise levels are consistent with the measurements taken at other nearby locations in the studies noted in Table 2-11, above.

Figure 2-7 - Noise Monitoring Locations

Table 2-12
Monitored Noise Levels[1]

Site No.	Location	Description	Noise Level (in $dBA_{(Leq)}$)
1	1600 Pennsylvania Avenue	White House, east side of north portico	58
2	1600 Pennsylvania Avenue	Street location in front of White House	64
3	Lafayette Square	Park, at center	61
4	St. John's Church, 1525 H Street	Church, front grounds facing on 16th Street	69
5	748 Jackson Place	Museum, Decatur House, corner of H Street and Jackson Place	71
6	17th Street and Pennsylvania Avenue	Museum, Renwick Gallery	68
7	Edward R. Murrow Park	Park, at intersection of H Street and Pennsylvania Avenue	67
8	Rawlins Park	Park, E Street, facing Department of Interior	63
9	17th and Constitution Avenue	Park	73
10	State Place	Monument, First Division Memorial Monument	56
11	E Street	White House, public viewing area, south of White House grounds	65
12	Pershing Park	Park, 14th Street and Pennsylvania Avenue	72
13	McPherson Square	Park, I Street and 15th Street	74
14	Farragut Square	Park, Connecticut Avenue and I Street	69

1 Monitoring conducted during daytime hours, August 29, 1996.

In order to identify possible impacts of the security action on traffic noise levels it is necessary to estimate what noise levels were in the vicinity of sensitive locations in the extended study area prior to May 20, 1995, and then compare those to noise levels following the security action. To do so, a noise prediction model, as noted below, was utilized to estimate both past noise levels and current noise levels generated by traffic. Post-action traffic data gathered for the preparation of the FHWA report, *Analysis of Transportation Conditions After Traffic Restriction and Street Modifications in the Vicinity of the White House*, was utilized for determining post-action noise levels. Pre-action traffic data that was collected by the NPS in the summer of 1992 and spring of 1993 was used to determine pre-action noise levels. The existing noise levels, as presented in Table 2-13, were used to validate the noise prediction model.

The FHWA Highway Traffic Noise Prediction Model - Manual Method [1] was used to estimate noise levels

[1] *FHWA Highway Traffic Noise Prediction Model*, Federal Highway Administration, 1978, Report No.

at the selected receptor locations. This model consists of a nomograph and set of equations utilizing as input vehicle types, traffic volumes, vehicle speeds, and distances to receptors. The model presents an estimate of traffic noise levels in $dBA_{(Leq)}$ and is particularly useful when examining relatively small sites such as those associated with receptors in the extended study area.

Table 2-13
Model Validation Using Predicted and Monitored Noise Levels in $dBA_{(Leq)}$

Site No.	Location	Predicted Noise Level	Measured Noise Level	Difference
1	1600 Pennsylvania Avenue	N/A	58	N/A
2	1600 Pennsylvania Avenue	N/A	64	N/A
3	Lafayette Square	N/A	61	N/A
4	St. John's Church, 1525 H Street	70	69	-1
5	748 Jackson Place	71	71	0
6	17th Street and Pennsylvania Avenue	72	68	-4
7	Edward R. Murrow Park	71	67	-4
8	Rawlins Park	67	63	-4
9	17th and Constitution Avenue	73	73	0
10	State Place	58	56	-2
11	E Street	68	65	-3
12	Pershing Park	74	72	-2
13	McPherson Square	71	74	+3
14	Farragut Square	72	69	-3

Using post-action traffic data from roadway segments adjacent to the 14 monitored sites, noise levels were estimated at these locations and compared to the actual monitored noise levels. Table 2-13 presents the results of the modeling in comparison to the actual measured noise levels.

The comparative analysis indicates that the FHWA model can closely predict actual noise levels based on the traffic and geometric data available. The differences, which range from 0 to 4 dBA, are acceptable for this level of analysis and represent noise levels that would, at a maximum, be barely perceptible to the human ear. In most cases where actual noise levels are below the modeled levels (Sites 4, 6, 7, 8, 10, 11, 12 and 14), the model does not account for the shielding effects of neighboring structures and thus predicts a slightly higher value. In the case of Site 13 (McPherson Square) notable lunch-time crowd noises

resulted in a higher actual reading compared to the predicted traffic-generated noise levels. At Sites 1, 2, and 3 at the White House a direct comparison of monitored and modeled traffic noise levels is not possible due to the removal of traffic from Pennsylvania Avenue at that location.

In order to determine the effects of the security action on traffic noise levels in the post-action period, the FHWA model was used to estimate the pre-action noise levels that were then compared to the post-action levels. Traffic data from the FHWA transportation analysis for locations adjacent to the 14 tested sites was used as input to the model. The results of this comparative analysis are presented in Table 2-14.

The analysis shows that noise levels decreased at most examined sensitive receptor sites. Noise levels decrease by 4 to 5 dBA at receptors along H Street (Sites 4 and 5) and at State Place (Site 10) and E Street (Site 11). Also, in comparing the results of actual noise measurements at receptors at the White House and Lafayette Square, as presented in Table 2-12, with the results of the estimated pre-action noise levels presented in Table 2-14, it is clear that noise levels at these particularly sensitive receptors have also dropped. At Site 1, the White House north portico, noise levels are estimated to have decreased 2 dBA. This decrease is minor, due to the distance of the site from Pennsylvania Avenue and the shielding and soft absorptive ground attenuation effects attributable to the site. At Site 2, the sidewalk location in front of the White House on Pennsylvania Avenue, a substantial decrease of 8 dBA is estimated to have occurred. This is a result of the removal of vehicular traffic from Pennsylvania Avenue at that location. In Lafayette Square (Site 3) noise levels are estimated to have decreased 3 dBA due to the removal of traffic from Pennsylvania Avenue and Madison Place.

The analysis also indicates that traffic noise levels at two locations on I Street (Site 13 at McPherson Square and Site 14 at Farragut Square) increase slightly, by 1 to 2 dBA, as a result of the shift in traffic to this roadway. These increases should not be perceptible. Although post-action traffic levels increased on Constitution Avenue (Site 9), the resulting increase in noise was offset by a decrease in noise from lower traffic levels on intersecting 17th Street. At other locations along Constitution Avenue, further from the 17th Street intersection, noise levels will have increased by less than 1 dBA, an imperceptible amount.

Table 2-14
Estimated Pre-action and Post-action Noise Levels in $dBA_{(Leq)}$

Site No.	Location	Pre-Action Noise Level	Post-Action Noise Level	Difference
1	1600 Pennsylvania Avenue	60	N/A	N/A
2	1600 Pennsylvania Avenue	72	N/A	N/A
3	Lafayette Square	64	N/A	N/A
4	St. John's Church, 1525 H Street	75	70	-5
5	748 Jackson Place	75	71	-4
6	17th Street and Pennsylvania Avenue	75	72	-3
7	Edward R. Murrow Park	73	71	-2
8	Rawlins Park	68	67	-1
9	17th and Constitution Avenue	73	73	0
10	State Place	64	58	-6

11	E Street	72	68	-4
12	Pershing Park	75	74	-1
13	McPherson Park	70	71	+1
14	Farragut Square	70	72	+2

In conclusion, it is estimated that traffic noise levels have decreased in the core study area, a NAC Category B area centered on the White House and the neighboring historic buildings and parkland, as a result of the removal and diversion of traffic from this area. As a consequence of the diversion, however, noise was shifted to the I Street corridor as evidenced by the estimated slight increases in noise at McPherson and Farragut Squares. This corridor, a retail and office NAC Category C area, is less sensitive to noise impacts.

While most noise levels in the area will continue to exceed the appropriate NAC as they did prior to the action, except in the core area near the White House, there are little or no practicable mitigation measures that can be employed. Noise barriers or other structural measures are not feasible due to the substantially negative impacts they would have on access and sightlines. Operational measures (e.g. the prohibition of truck traffic) are not feasible either, due to the need to maintain traffic flow and vehicular access to this central core area of the city. Given that the estimated increases in noise in the I Street corridor are relatively minor (i.e., less than a perceptible amount), no mitigation is recommended.